A Tool for Extending Mixed Reality Space from Web2D Visualization Anywhere

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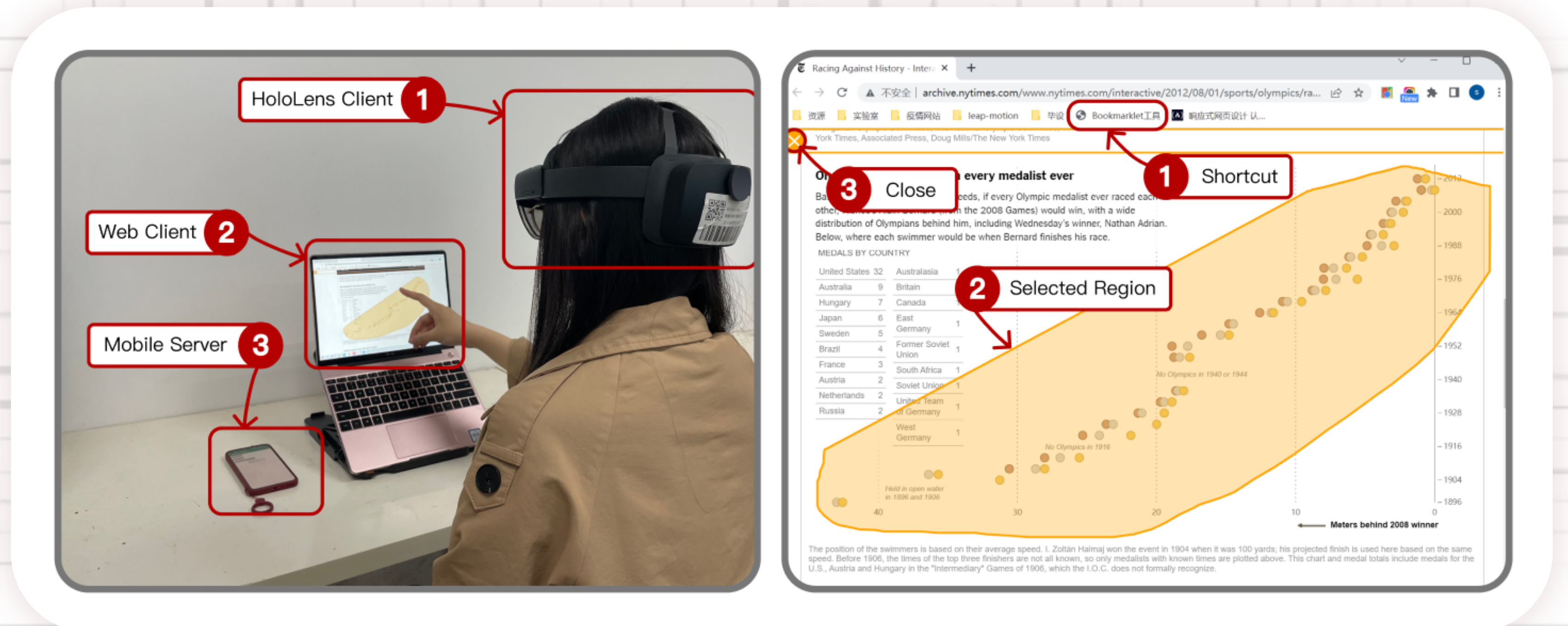
Introduction

Multi-source mixed reality visualization is a visualization method that combines 2D plane visualization and immersive visualization. It presents unique advantages in data understanding and collaborative interaction. However, hybrid visualization systems are expensive to build.

In this paper, we implemented X-Space, a tool that can extend the mixed reality 3D space for Web2D visualization anytime and anywhere. It captures data bound in 2D visualizations, deconstructs them into a data stream, and then transfers them to mixed reality 3D spaces by freehand interaction. At the same time, we equipped the tool with a data API for existing 3D visualization construct tools .
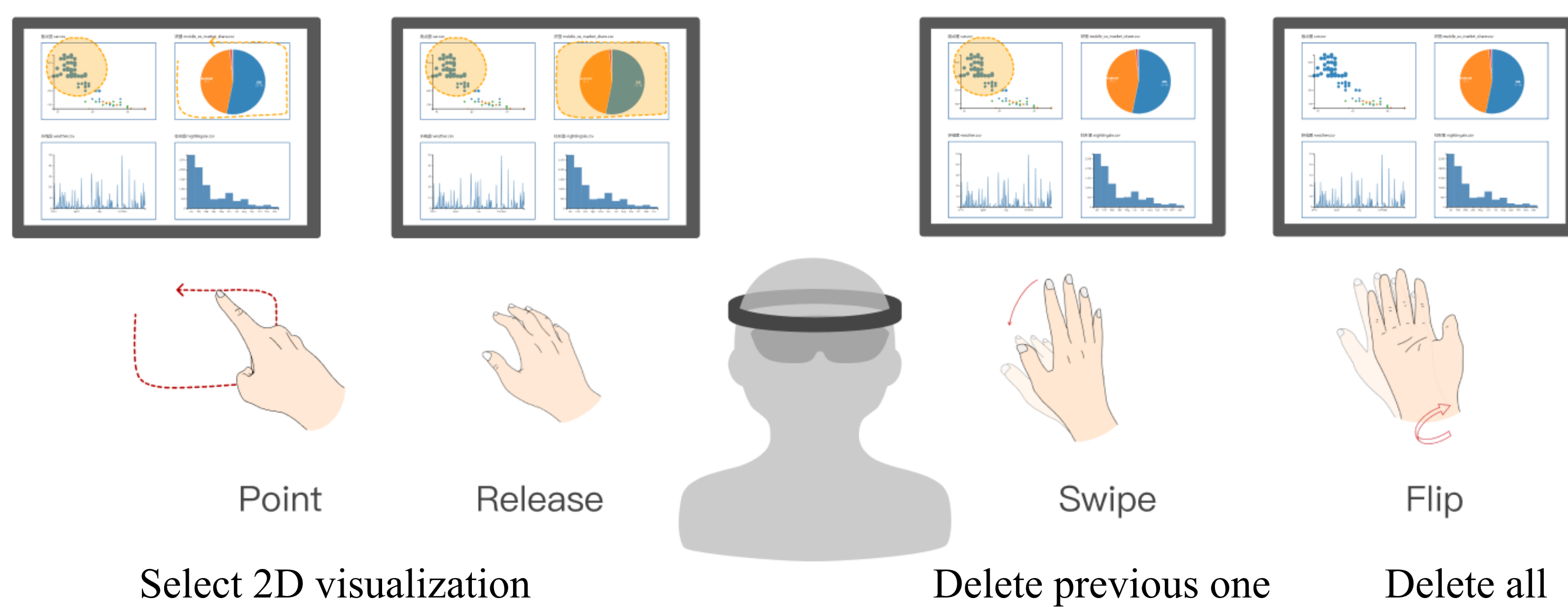
X-Space System Design

X-Space aims to (1) help users deconstruct Web-based visualizations; (2) realize the natural and easy switch of visualization data from 2D to 3D space; (3) provide a mixed reality visualization 3D space.

It uses a client-server architecture. The mobile server is responsible for transferring information between client devices. While the Bookmarklet tool is responsible for deconstructing 2D visualization data, the HoloLens application serves as an interface for freehand interaction input and a vehicle for 3D visualization space.

Interaction Design

❶ 2D visualization selection

Point	Release	Swipe	Flip
Select 2D visualization		Delete previous one	Delete all

we treat a 2D screen as a canvas in 3D space, in which users can manipulate visualizations they are interested in as interactive objects.

❷ Visualization data transfer

Pinch

During data transfer, X-Space first generates a red sphere of energy around 2D visualization. This wraps 2D visualization into a data ball to lock user's interaction object. The data ball then moves to the user's interactive position autonomically, where the "Pinch" gesture interacts directly with 3D spatial objects.

❸ Data storage box and 3D visualization

X-Space allows users to generate 3D visualization directly from 2D visualization data, and also provides a data storage box to store visualization data. 3D visualizations and data balls of 3D space can be converted to each other.
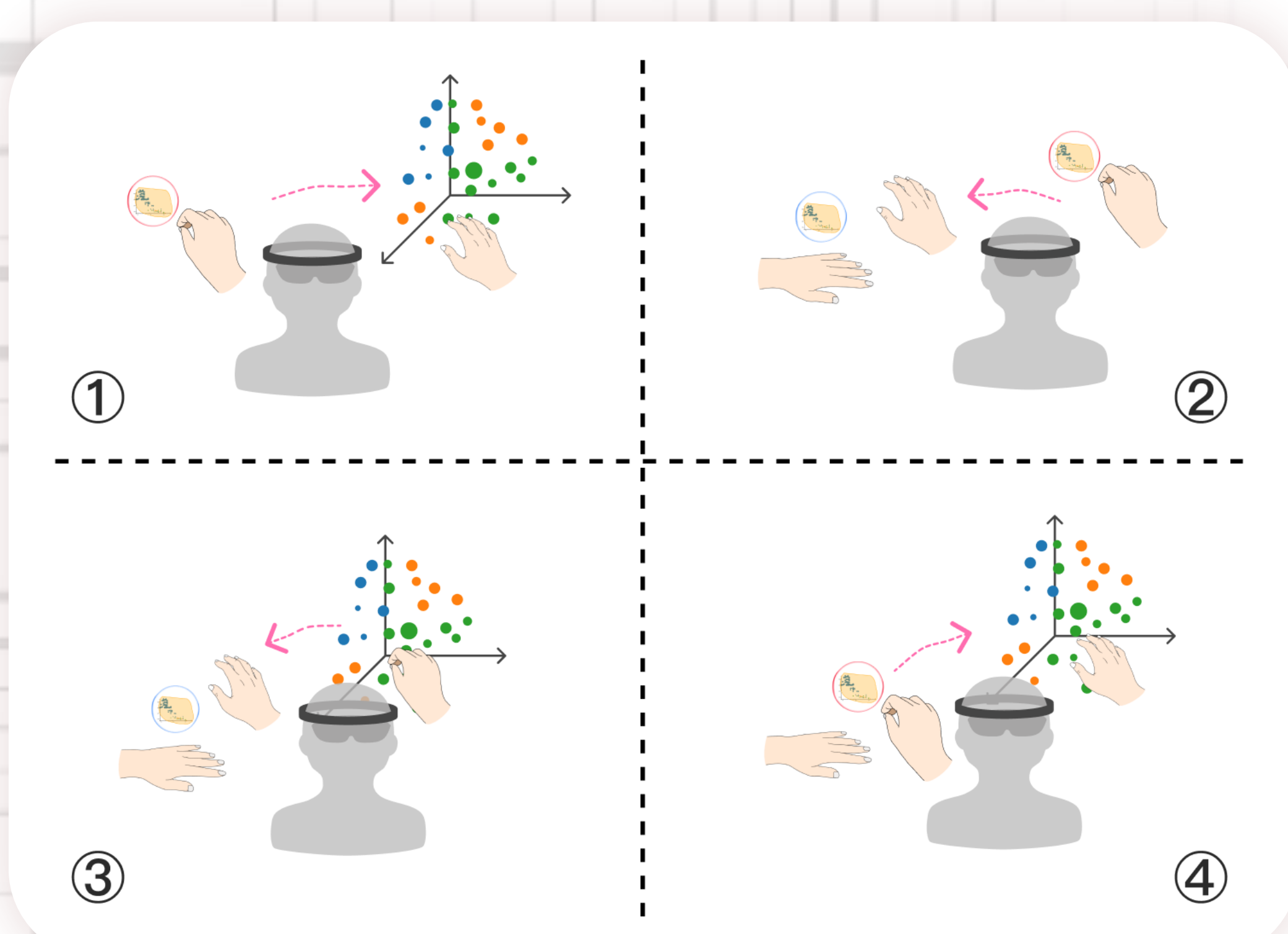

Use Cases

We use X-Space to extract 2D visualizations from multiple sources and forms. In 3D space, we use DxR construction tool to generate visualization directly.

Conclusion

We proposed X-Space, a tool for transferring Web-based 2D visualization data to 3D space. It integrates 3D space for 2D visualization with freehand interaction. X-Space currently renders immersive visualizations through DxR. Meanwhile, X-Space also provides a data storage box on the mixed reality client for temporary data storage. Future work includes (1)Multi-device, multi-person collaboration; (2)Compatibility of 3D visualization construction tools.